SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifiers:

Product trade name: CURE-RITE* 18 Powder
Company product number: C18
Other means of identification: Morpholin-4-yl morpholine-4-carbodithioate
REACH registration number: 01-2119537273-42-0000
Substance name: 4-((Morpholinothio)thioxomethyl)morpholine
Substance identification number: EC 237-335-9

1.2. Relevant identified uses of the substance or mixture and uses advised against:

Uses: Vulcanizing agent, cure accelerator for rubber. See Annex for covered uses.
Uses advised against: Pulverization.

1.3. Details of the supplier of the safety data sheet:

Manufacturer/Supplier: Emerald Performance Materials, LLC
2020 Front Street, Suite 100
Cuyahoga Falls, Ohio 44221
United States
Telephone: +001-330-916-6700
FAX: +001-330-916-6734

EU Only Representative: LSR Associates, Ltd.
Woolley Road, Alconbury
Cambs, United Kingdom PE28 4HS
Telephone: +44 (0) 1954 212 132
e-mail: info@lsr-associates.com

For further information about this SDS: Email: product.compliance@emeraldmaterials.com

1.4. Emergency telephone number:


SECTION 2: Hazards identification

2.1. Classification of the substance or mixture:

Product classification according to Regulation (EC) 1272/2008 (CLP) as amended:
Carcinogenicity, category 1B, H350
Hazardous to the aquatic environment, Chronic, category 2, H411

Product classification according to Directive 67/548/EEC or 1999/45/EC as amended:
Dangerous For The Environment, Toxic
R45 May cause cancer.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

2.2. Label elements:

Product labeling according to Regulation (EC) 1272/2008 (CLP) as amended:
Hazard pictogram(s):

Signal word:
SDS Name: CURE-RITE* 18 Powder

Danger

Hazard statements:
H350 May cause cancer.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local, regional and international regulations.

Supplemental information: No Additional Information

Precautionary statements are listed according to the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Annex III. Regulations in individual countries/regions may determine which statements are required on the product label. See product label for specifics.

2.3. Other hazards:
PBT/vPvB criteria: This product does not meet the PBT and vPvB classification criteria.
Other hazards: May form combustible dust concentrations in air.

See Section 11 for toxicological information.

SECTION 3: Composition/information on ingredients

3.1. Substance:

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Chemical Name</th>
<th>Weight%</th>
<th>EC Number</th>
<th>Symbols</th>
<th>EU R Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0013752-51-7</td>
<td>N-Oxydiethylenethiocarbamyl-N’-oxydiethylenesulfenamide</td>
<td>95-100</td>
<td>237-335-9</td>
<td>N, T</td>
<td>R45-51/53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0013752-51-7</td>
<td>N-Oxydiethylenethiocarbamyl-N’-oxydiethylenesulfenamide</td>
<td>01-2119537273-42-0000</td>
<td>Aquatic Chronic 2- Carc. 1B</td>
<td>H350-411</td>
</tr>
</tbody>
</table>

See Section 16 for full text of R (Risk) phrases and H (Hazard) statements.

Amounts specified are typical and do not represent a specification. Remaining components are proprietary, non-hazardous, and/or present at amounts below reportable limits.

SECTION 4: First aid measures

4.1. Description of first aid measures:

General: If irritation or other symptoms occur or persist from any route of exposure, remove the affected individual from the area: see a physician/get medical attention.

Eye contact: Immediately flush eyes with plenty of clean water for an extended time, not less than fifteen (15) minutes. Flush longer if there is any indication of residual chemical in the eye. Ensure adequate flushing of the eyes by separating the eyelids with fingers and roll eyes in a circular motion. If eye irritation persists: Get medical advice/attention.

Skin contact: Immediately remove contaminated clothing and shoes. Wash the affected area with plenty of soap and water until no evidence of the chemical remains (at least 15-20 minutes). Launder clothing before reuse. If skin irritation occurs: Get medical advice/attention.

Inhalation: If affected, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a POISON CENTER or doctor/physician if you feel unwell. If any processing vapors, decomposition products or particulates are inhaled, remove individual(s) to fresh air. Provide protection before allowing reentry.

Ingestion: Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse out the mouth with water. Get medical attention immediately.

Protection of first aid responders: Wear proper personal protective clothing and equipment.
4.2. Most important symptoms and effects, both acute and delayed:
Irritation. Pre-existing skin problems may be aggravated by prolonged or repeated contact. Persons with sensitive airways (e.g., asthmatics) may react to airborne dust or vapors. See section 11 for additional information.

4.3. Indication of any immediate medical attention and special treatment needed:
Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media:
Suitable: Use water spray, dry chemical, or foam. Carbon dioxide may be ineffective on larger fires due to a lack of cooling capacity which may result in reignition.

Unsuitable: Avoid hose streams or any method which will create dust clouds.

5.2. Special hazards arising from substance or mixture:
Unusual fire/explosion hazards: Concentrated dust/air combinations may produce explosive conditions. As with all organic dusts, fine particles suspended in air in critical proportions and in the presence of an ignition source may ignite and/or explode. Dust may be sensitive to ignition by electrostatic discharge, electrical arcs, sparks, welding torches, cigarettes, open flame, or other significant heat sources. As a precaution, implement standard safety measures for handling finely divided organic powders. See Section 7 for suggested measures.

Hazardous combustion products: Irritating or toxic substances may be emitted upon burning, combustion or decomposition. See section 10 (10.6 Hazardous decomposition products) for additional information.

5.3. Advice for fire-fighters:
Avoid hose streams or any method which will create dust clouds. Wear self-contained breathing apparatus (SCBA) equipped with a full facepiece and operated in a pressure-demand mode (or other positive pressure mode) and approved protective clothing. Personnel without suitable respiratory protection must leave the area to prevent significant exposure to hazardous gases from combustion, burning or decomposition. In an enclosed or poorly ventilated area, wear SCBA during cleanup immediately after a fire as well as during the attack phase of firefighting operations.

See section 9 for additional information.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures:
See Section 8 for recommendations on the use of personal protective equipment. If spilled in an enclosed area, ventilate. Avoid raising powdered material due to explosion hazard. Use spark-proof and explosion-proof equipment. If inhalation of dust cannot be avoided, wear an approved particulate respirator. Personal Protective Equipment must be worn.

6.2. Environmental precautions:
Do not flush product into public sewer, water systems or surface waters.

6.3. Methods and material for containment and cleaning up:
Contain spill. Wear proper personal protective clothing and equipment. Using care to avoid dust generation, vacuum or sweep into a closed container for reuse or disposal. Use approved industrial vacuum cleaner for removal. Avoid causing dust. Place into labeled, closed container; store in safe location to await disposal. Change contaminated clothing and launder before reuse.

6.4. References to other sections:
See Section 8 for recommendations on the use of personal protection and Section 13 for waste disposal.

SECTION 7: Handling and storage

7.1. Precautions for safe handling:
As with any chemical product, use good laboratory/workplace procedures. Do not get in eyes, on skin or clothing. Do not breathe dust, vapor, aerosol, mist or gas. Do not ingest, taste, or swallow. Wash thoroughly after handling this product. Always wash up before eating, smoking or using the facilities. Use under well-ventilated conditions. Avoid routine inhalation
of dust of any kind. Exercise care when emptying containers, sweeping, mixing or doing other tasks which can create dust. Wash contaminated clothing before reuse. Provide eyewash fountains and safety showers in the work area. As a precaution to control dust explosion potential, implement the following safety measures: Eliminate ignition sources (e.g., sparks, static buildup, excessive heat, etc.). In general, dust of organic materials is a static charge generator which may be ignited by electrostatic discharge, electrical arcs, sparks, welding torches, cigarettes, open flame, or other significant heat sources. Use spark-proof tools and equipment. Bond, ground and properly vent conveyors, dust control devices and other transfer equipment. Prohibit flow of polymer, powder or dust through non-conductive ducts, vacuum hoses or pipes, etc.; only use grounded, electrically conductive transfer lines when pneumatically conveying product. Good housekeeping and controlling of dusts are necessary for safe handling of product. Prevent accumulation of dust (e.g., well-ventilated conditions, promptly vacuuming spills, cleaning overhead horizontal surfaces, etc.).

7.2. Conditions for safe storage, including any compatibilities:

Store cool and dry, under well-ventilated conditions. Store this material away from incompatible substances (see section 10). Do not store in open, unlabeled or mislabeled containers. Keep container closed when not in use. Empty container contains residual product which may exhibit hazards of product. Do not reuse empty container without commercial cleaning or reconditioning.

7.3. Specific end use(s):

Further information concerning special risk management measures: see annex of this safety data sheet (exposure scenarios).

SECTION 8: Exposure controls / personal protection

8.1. Control parameters:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>EU OEEL</th>
<th>EU OELV</th>
<th>ACGIH - TWA</th>
<th>ACGIH - STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
<td>N/E</td>
</tr>
</tbody>
</table>

N/E=Not established (no exposure limits established for the listed substances for listed country/region/organization).

Emerald Performance Materials recommended exposure threshold limit value for N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide is 0.1 mg/m3, 8-hour TWA. PNOS: ACGIH has recommended the following exposure limits for Particulates (insoluble or poorly soluble) not otherwise specified (PNOS): 10 mg/m3 TWA (inhalable particles), 3 mg/m3 TWA (respirable particles). Belgium: 3 mg/m3 TWA (alveolar fraction); 10 mg/m3 TWA (inhalable fraction). Germany MAK Values for dust: 1.5 mg/m3 MAK (respirable fraction); 4 mg/m3 MAK (inhalable fraction). Portugal: 10 mg/m3 TWA (inhalable fraction); 3 mg/m3 TWA (respirable fraction). Spain: 10 mg/m3 VLA-ED (inhalable fraction); 3 mg/m3 VLA-ED (respirable fraction).

Derived No Effect Levels (DNELs) - Workers:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Inhalation-Acute (local)</th>
<th>Inhalation-Acute (systemic)</th>
<th>Inhalation-Long Term (local)</th>
<th>Inhalation-Long Term (systemic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>1.789 mg/m3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Dermal-Acute (local)</th>
<th>Dermal-Acute (systemic)</th>
<th>Dermal-Long Term (local)</th>
<th>Dermal-Long Term (systemic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0.204 mg/kg bw/day</td>
</tr>
</tbody>
</table>

Predicted No Effect Concentration (PNECs):

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Freshwater</th>
<th>Marine water</th>
<th>Intermittent releases</th>
<th>Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>0.0016 mg/L</td>
<td>0.0016 mg/L</td>
<td>0.016 mg/L</td>
<td>0.00232 mg/kg soil dw</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Sediment (freshwater)</th>
<th>Sediment (marine)</th>
<th>STP</th>
<th>Oral</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>0.00388 mg/kg sediment dw</td>
<td>0.000388 mg/kg sediment dw</td>
<td>10 mg/L</td>
<td>no potential to bioconcentrate</td>
</tr>
</tbody>
</table>

N/E=Not established; N/A=Not applicable (not required); bw=body weight; dw=dry weight; ww=wet weight.

8.2. Exposure controls:

Appropriate engineering controls: Always provide effective general and, when necessary, local exhaust ventilation to draw dust away from workers to prevent routine inhalation. Ventilation must be adequate to maintain the ambient workplace atmosphere below the exposure limit(s) outlined in the SDS. Eliminate ignition sources (e.g., sparks, static buildup, excessive...
SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Powder</td>
</tr>
<tr>
<td>Appearance</td>
<td>Off-white to yellow</td>
</tr>
<tr>
<td>Odour</td>
<td>Slight aromatic</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Not Available</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>0.127 g/L @ 20°C</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>0.00001153 hPa (25 °C)</td>
</tr>
<tr>
<td>Vapour density</td>
<td>Not Available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not Available</td>
</tr>
<tr>
<td>Melting point/Freezing point</td>
<td>130-140°C (266-284°F)</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Not oxidizing</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not explosive</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not Available</td>
</tr>
<tr>
<td>pH</td>
<td>Not Available</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.3-1.4</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water):</td>
<td>1.65</td>
</tr>
<tr>
<td>% Volatile by weight</td>
<td>Not Available</td>
</tr>
<tr>
<td>VOC</td>
<td>Not Available</td>
</tr>
<tr>
<td>Boiling point °C</td>
<td>Decomposes before boiling</td>
</tr>
<tr>
<td>Boiling point °F</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Decomposes before boiling</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>275°C (527°F)</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>May form combustible (explosive) dust-air mixtures.</td>
</tr>
<tr>
<td>Flammability or explosive limits:</td>
<td>LFL/LEL Not Available</td>
</tr>
<tr>
<td></td>
<td>UFL/UEL Not Available</td>
</tr>
<tr>
<td>Minimum explosive concentration:</td>
<td>0.03 oz/ft3 (30 g/m3)</td>
</tr>
<tr>
<td>Minimum ignition energy (dust cloud):</td>
<td>0.20 joules</td>
</tr>
<tr>
<td>Maximum rate of pressure rise:</td>
<td>14,700 psi/sec @ 0.1 oz/ft3 (1,010 bars/sec @ 100 g/m3)</td>
</tr>
<tr>
<td>Maximum pressure of explosion:</td>
<td>83 psig @ 0.5 oz/ft3 (5.7 bars-gauge @ 500 g/m3)</td>
</tr>
<tr>
<td>Explosion severity ratio:</td>
<td>5.83 (severe)</td>
</tr>
<tr>
<td>Deflagration Index, Kst (estimate):</td>
<td>355 bar m/sec</td>
</tr>
<tr>
<td>Ignition sensitivity</td>
<td>Strong</td>
</tr>
<tr>
<td>Volume resistivity</td>
<td>1.01 x 10^14 ohm-cm</td>
</tr>
<tr>
<td>National Electrical Code (NFPA 70):</td>
<td>Group G dust</td>
</tr>
</tbody>
</table>

9.2. Other information:

Amounts specified are typical and do not represent a specification.

**Dust combustibility data:** N- OXYDIETHYLENETHIOCARBAMYL-N’-OXYDIETHYLENESULFENAMIDE: The following characteristics apply to powder and are expected to apply to dust from pellets reduced to a powder:

- Minimum explosive concentration: 0.03 oz/ft3 (30 g/m3)
- Minimum ignition energy (dust cloud): 0.20 joules
- Maximum rate of pressure rise: 14,700 psi/sec @ 0.1 oz/ft3 (1,010 bars/sec @ 100 g/m3)
- Maximum pressure of explosion: 83 psig @ 0.5 oz/ft3 (5.7 bars-gauge @ 500 g/m3)
- Explosion severity ratio: 5.83 (severe)
- Deflagration Index, Kst (estimate): 355 bar m/sec
- Ignition sensitivity: Strong
- Volume resistivity: 1.01 x 10^14 ohm-cm
SECTION 10: Stability and reactivity

10.1. Reactivity:
Reaction with nitrites, nitrates and/or other nitrosating agents may lead to the formation of nitrosamines.

10.2. Chemical stability:
This product is stable. Prolonged storage above 43 °C (109 °F) will initiate chemical changes resulting in loss of accelerator functionality.

10.3. Possibility of hazardous reactions:
Hazardous polymerization will not occur.

10.4. Conditions to avoid:
Avoid dust formation.

10.5. Incompatible materials:
Avoid contact with strong oxidizing agents. Avoid contact with nitrosating agents.

10.6. Hazardous decomposition products:
Carbon dioxide, carbon monoxide, hydrocarbons, oxides of nitrogen, and oxides of sulfur. May liberate morpholine vapor when heated above 266°F (130°C).

SECTION 11: Toxicological information

11.1. Information on toxicological effects:

Information on likely routes of exposure:

General: Caution must be exercised through the prudent use of protective equipment and handling procedures to minimize exposure. N-OXYDIETHYLENETHIOCARBAMYL-N'-OXYDIETHYLENESULFENAMIDE: Possible cancer hazard - may cause cancer based on animal data.

Eyes: Solid particles on the eye (powder/dust) may cause pain and be accompanied by irritation.

Skin: May cause skin irritation.

Inhalation: Dust inhalation may cause respiratory irritation.

Ingestion: Ingestion may cause irritation.

Acute toxicity information: Not classified (based on available data, the classification criteria are not met). N-OXYDIETHYLENETHIOCARBAMYL-N'-OXYDIETHYLENESULFENAMIDE (CURE-RITE* 18): Inhalation by rats of 164.4 mg of CURE-RITE* 18 dust per liter of air for one hour did not produce any compound related toxic effects or mortality.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Inhalation LC50</th>
<th>Species</th>
<th>Oral LD50</th>
<th>Species</th>
<th>Dermal LD50</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;164.4 mg/L (1 hour, no mortalities)</td>
<td>Rat/ adult</td>
<td>5200 mg/kg</td>
<td>Rat/ adult</td>
<td>&gt;10000 mg/kg</td>
<td>Rabbit/ adult</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation: Not classified (based on available data, the classification criteria are not met).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Skin irritation</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-irritant</td>
<td>Rabbit/ adult</td>
</tr>
</tbody>
</table>

Serious eye damage/irritation: Not classified (based on available data, the classification criteria are not met). N-OXYDIETHYLENETHIOCARBAMYL-N'-OXYDIETHYLENESULFENAMIDE (CURE-RITE* 18): Eye irritation, rabbits: mild, reversible irritant.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Eye irritation</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild-slight irritant</td>
<td>Rabbit/ adult</td>
</tr>
</tbody>
</table>

Respiratory or skin sensitization: Not classified (based on available data, the classification criteria are not met).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Skin sensitisation</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-sensitizer</td>
<td>Local Lymph Node Assay (OECD 429)</td>
</tr>
</tbody>
</table>

Carcinogenicity: May cause cancer - Category 1. N-OXYDIETHYLENETHIOCARBAMYL-N'-
OXYDIETHYLENESULFENAMIDE (CURE-RITE* 18): CURE-RITE* 18 is a possible cancer hazard based on a two year feeding study in which rats developed urinary tract tumors. Dust exposure is the main concern. Inhalation and skin contact should be minimized. Only limited evidence of toxic effect occurred in groups of rats fed 0, 20, 60, 200, or 600 ppm of CURE-RITE* 18 in their daily diet for over two years. No tumors or other compound related effects occurred at the three lower exposure levels (20, 60 and 200 ppm). Effects to the high dose group (600 ppm) consisted of decreased body weight and a pronounced incidence of rales (noise in the lungs). No tissue damage was observed in the lungs of these animals. Microscopic tissue examination revealed an increased evidence of urinary tumors in the high dose rats. That the risk of tumor induction diminishes rapidly with dose is suggested by the presence of tumors only in the high dose (600 ppm) animals. The absence of any tumors at 200 ppm (10.2 mg/kg bw/day) or lower is important although a "no effect" or "safe" level cannot be set. To man, 200 ppm is equivalent to a workplace exposure of approximately 12 mg of CURE-RITE* 18 dust per m3 of air. Applying a 100 safety factor results in an exposure level of approximately 0.100 mg CURE-RITE* 18 per m3 of air. While a safety factor of 100 is more commonly used for nongenotoxic agents, we believe that such a level will significantly minimize any risk. This level can be achieved by good industrial hygiene practice, well ventilated conditions and by following the guidelines in this safety data sheet. Pellets should enable even lower exposure levels to be achieved.

Germ cell mutagenicity: Not classified (based on available data, the classification criteria are not met).

Reproductive toxicity: Not classified (based on available data, the classification criteria are not met).

Specific target organ toxicity (STOT) - single exposure: Not classified (based on available data, the classification criteria are not met).

Specific target organ toxicity (STOT) - repeated exposure: Not classified (based on available data, the classification criteria are not met).

Aspiration hazard: Not classified (technical impossibility to obtain the data).

Other toxicity information: No additional information available.

SECTION 12: Ecological information

12.1. Toxicity:

N-OXYDIETHYLETHIOCARBAMYL-N'-OXYDIETHYLENESULFENAMIDE: Microorganism Toxicity (activated sludge): The acute EC50 is > 1000 mg/L, 3 hours (OECD 209).

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Fish 96 hour LC50</th>
<th>Fish 96 hour LC50</th>
<th>Fish Chronic NOEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>9.12 mg/L</td>
<td>N/E</td>
<td>N/E</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability:

N-OXYDIETHYLETHIOCARBAMYL-N'-OXYDIETHYLENESULFENAMIDE: Not readily biodegradable. This material is inherently biodegradable (OECD 301B). This material undergoes a moderate to rapid rate of hydrolysis under environmental conditions and rapid hydrolysis under acidic conditions.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Biodegradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide</td>
<td>Not readily biodegradable (OECD 301B)</td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential:
12.4. Mobility in soil:
High mobility in soil is expected.

12.5. Results of PBT and vPvB assessment:
This product does not meet the PBT and vPvB classification criteria.

12.6. Other adverse effects:
No additional information available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods:
Dispose of unused contents (incineration or landfill) in accordance with national and local regulations. Dispose of container in accordance with national and local regulations. Ensure the use of properly authorized waste management companies, where appropriate.

See Section 8 for recommendations on the use of personal protective equipment.

SECTION 14: Transport information

The information below is provided to assist in documentation. It may supplement the information on the package. The package in your possession may carry a different version of the label depending on the date of manufacture. Depending on inner packaging quantities and packaging instructions, it may be subject to specific regulatory exceptions.

14.1. UN number: UN3077

14.2. UN proper shipping name:
Environmentally Hazardous Substance, Solid, N.O.S. (N-Oxydiethylenethiocarbamyl-N'-oxydiethylenesulfenamide)

14.3. Transport hazard class(es):
U.S. DOT hazard class: N/A
Canada TDG hazard class: N/A
Europe ADR/RID hazard class: 9
IMDG Code (ocean) hazard class: 9
ICAO/IATA (air) hazard class: 9

A "N/A" listing for the hazard class indicates the product is not regulated for transport by that regulation.

14.4. Packing group: III

14.5. Environmental hazards:
Marine pollutant: Marine Pollutant (IMDG code 2.9.3).
Hazardous substance (USA): Not Applicable

14.6. Special precautions for user:
Not Applicable

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code:
Not Applicable

Notes: For surface shipments within the United States: Not regulated.
SECTION 15: Regulatory information

15.1. Safety, health and environment regulations/legislation specific for the substance or mixture:

Europe REACH (EC) 1907/2006: Applicable components are registered.

EU Authorizations and/or restrictions on use: Not Applicable

Other EU information: No Additional Information

National regulations: No Additional Information

Chemical inventories:

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Inventory of Existing Chemical Substances (EINECS):</td>
<td>Y</td>
</tr>
<tr>
<td>European List of Notified Chemical Substances (ELINCS):</td>
<td>N</td>
</tr>
<tr>
<td>U.S. Toxic Substances Control Act (TSCA):</td>
<td>Y</td>
</tr>
</tbody>
</table>

A "Y" listing indicates all intentionally added components are either listed or are otherwise compliant with the regulation. A "N" listing indicates that for one or more components: 1) there is no listing on the public inventory; 2) no information is available; or 3) the component has not been reviewed.

15.2. Chemical safety assessment:

A chemical safety assessment has been carried out for the substance or mixture.

SECTION 16: Other information

Risk (R) phrases in the Composition section (Section 3):

R45 May cause cancer.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Hazard (H) Statements in the Composition section (Section 3):

H350 May cause cancer.
H411 Toxic to aquatic life with long lasting effects.

Reason for revision: Changes in Section(s): Not Applicable

Evaluation method for classification of mixtures: Not Applicable (substance)

Legend:

*: Trademark owned by Emerald Performance Materials, LLC.
ACGIH: American Conference of Governmental Industrial Hygienists
EU OELV: European Union Occupational Exposure Limit Value
EU IOELV: European Union Indicative Occupational Exposure Limit Value
N/A: Not Applicable
N/E: None Established
STEL: Short Term Exposure Limit
TWA: Time Weighted Average (exposure for 8-hour workday)

Users Responsibility/Disclaimer of Liability:

The information set forth herein is based on our current knowledge, and is intended to describe the product solely with respect to health, safety and the environment. As such, it must not be interpreted as a guarantee of any specific property of the product. As a result, the customer shall be solely responsible for deciding whether said information is suitable and beneficial.

Safety Data Sheet Preparer:
Product Compliance Department
Emerald Performance Materials, LLC
2020 Front Street, Suite 100
Cuyahoga Falls, Ohio 44221
United States

Annex

Exposure Scenarios

Substance information:
SDS Name: CURE-RITE* 18 Powder

Name of substance: N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide.
EC# 237-335-9 / CAS# 13752-51-7
REACH Registration number: 01-2119537273-42-000

List of exposure scenarios:
ES1: Use as Laboratory Reagent.
ES2: Formulating.
ES3: Laboratory sampling - pilot plant.
ES4: Manufacture of Rubber Articles.
ES5: Manufacture of Tyres.

General remarks:
N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide (substance) is used as a vulcanizing agent in the manufacture of rubber articles and tyres. Once this substance is processed, it is no longer available as N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide. The exposure assessments cover the life cycle of the substance until the vulcanization reaction is complete. N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide is no longer available after the vulcanization reaction. This substance can either be used "as such" or formulated into a preparation. This substance is not manufactured in the European Union. The substance is used in industrial settings only. Therefore an exposure assessment for professional and consumer exposure is not necessary. The primary long term routes of industrial exposure are skin contact and inhalation. In an industrial setting, ingestion is not an anticipated route of exposure. Short-term systemic exposures were not calculated due to the lack of short-term systemic effects.

Exposure scenario (1): Use as Laboratory Reagent
1. Exposure scenario (1)
   Short title of the exposure scenario: Use as Laboratory Reagent
   List of use descriptors:
   - Sector of use category (SU): SU9
   - Product category (PC): PC21
   - Process category (PROC): PROC15
   - Environmental Release Category (ERC): ERC1


   List of names of contributing worker scenarios and corresponding PROCs:
   PROC15 Use as laboratory reagent. Use of substances at small scale laboratory (< 1 l or 1 kg present at workplace).

   Name of contributing environmental scenario and corresponding ERCs:
   ERC1 Manufacture of substances. Manufacture of organic and inorganic substances in chemical, petrochemical, primary metals and minerals industry including intermediates, monomers using continuous processes or batch processes applying dedicated or multi-purpose equipment, ei-ther technically controlled or operated by manual interventions.

2. Operational conditions and risk management measures
2.1 Control of workers exposure
   Product characteristics: Concentration of substance: 100%. Physical state: solid.
   Amounts used: This information is not relevant for assessment of worker's exposure.
   Frequency and duration of use/exposure: Duration: >4 hours/day. Frequency: <=10 days/year.
   Human factors not influenced by risk management: Not relevant
   Other given operational conditions affecting workers exposure: Location: Indoor use. Domain: Industrial use.
   Technical conditions and measures at process level (source) to prevent release: Not relevant
   Technical conditions and measures to control dispersion from source towards the worker: Local exhaust ventilation: Yes (90% effectiveness).
   Organisational measures to prevent/limit releases, dispersion and exposure: Not relevant
   Conditions and measures related to personal protection, hygiene and health evaluation: Respiratory protection: Not required. Gloves: While gloves are not necessary to reach an RCR of <1, it is recommended they be worn as part of good laboratory practice.
2.2 Control of environmental exposure

**Product characteristics:**
- Concentration of substance: 100%.
- Physical state: solid.

**Amounts used:**
- Maximum daily use at a site: 1 kg/day.
- Maximum annual use at a site: 10 kg/year.
- Fraction of the main local source: 0.1.

**Frequency and duration of use:**
- Emission days: 10 days/year.
- Intermittent release.

**Environmental factors not influenced by risk management:**
- Flow rate of receiving surface water: >=18,000 m3/day (default).

**Other given operational conditions affecting environmental exposure:**
- Industry category: 3: Chemical industry - chemicals used in synthesis.
- Use category: 53: Vulcanizing agents.
- Main category industrial use: III Non-dispersive.
- Extra details on use category: No extra details necessary.
- Emission tables: A3.3 (IC-specific), B3.2 (general table).
- Industrial use.
- Release fraction to air from process: 1E-05 (default).
- Release fraction to wastewater from process: 0.02 (default).
- Release fraction to soil from process: 1E-04 (default).

**Technical conditions and measures at process level (source) to prevent release:**
- Fraction connected to sewer system: 80% (default).

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:**
- Dry sludge application to agricultural soil: Yes (default).

**Organisational measures to prevent/limit releases from site:**
- Fraction of EU tonnage used in region (private use): 10% (default).

**Conditions and measures related to municipal sewage treatment plant:**
- Municipal Sewage Treatment Plant (STP): Yes (freshwater), No (marine assessment).
- Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town).
- Sewage Sludge Incineration: No (default).
- Concentration of chemical in untreated waste water: 1E-03 mg/L (EUSES output).
- Concentration of chemical (total) in the STP effluent: 9.91E-04 mg/L (EUSES output).

**Conditions and measures related to external treatment of waste for disposal:**
- Not relevant

**Conditions and measures related to external recovery of waste:**
- Not relevant

**Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:**
- Spills are cleaned immediately.

3. Exposure estimation

**Health**

**Information for contributing scenario (1):** PROC15

**Assessment method:** ECETOC TRA Worker v2.0 with modifications.

**Exposure estimation:**

<table>
<thead>
<tr>
<th>Route</th>
<th>Exposure estimate</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker, long-term, local</td>
<td>Dermal</td>
<td>0.00343 mg/kg bw/day</td>
<td>0.017</td>
</tr>
<tr>
<td>Worker, long-term, local</td>
<td>Inhalation</td>
<td>0.500 mg/m3</td>
<td>0.28</td>
</tr>
</tbody>
</table>
**Information for contributing scenario (2):**

**ERC1**

**Assessment method:**
- EUSES v2.1 based on 10 EU sites.

**Exposure estimation:**

<table>
<thead>
<tr>
<th>Compartment</th>
<th>PEC</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>0.0000991 mg/L</td>
<td>0.006</td>
<td>Intermittent release based on 10 days/year</td>
</tr>
<tr>
<td>Freshwater sediment</td>
<td>0.00024 mg/kg ww</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Marine water</td>
<td>0.00001 mg/L</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Marine water sediment</td>
<td>0.000242 mg/kg ww</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>0.000111 mg/kg ww</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>STP</td>
<td>0.001 mg/L</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>0.00000000000762 mg/m3</td>
<td>Not Available</td>
<td></td>
</tr>
</tbody>
</table>

**RCR** = Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); **PEC** = Predicted environmental concentration.

4. **Guidance to the Downstream User to evaluate whether he works inside the boundaries of the ES**

**Health:**
- Indoor use, medium dustiness, LEV used, no respirator required. Duration of activity >4 hours. Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training. Concentration of substance: Up to 100%.

**Environment:**
- Intermittent release based on 10 days/year. Maximum daily use at a site: 1 kg/day.

**Exposure scenario (2): Formulating**

1. **Exposure scenario (2)**

**Short title of the exposure scenario:** Formulating

**List of use descriptors:**

- **Sector of use category (SU):** SU10
- **Product category (PC):** PC32
- **Process category (PROC):** PROC2, PROC3, PROC5, PROC14
- **Environmental Release Category (ERC):** ERC2


**List of names of contributing worker scenarios and corresponding PROCs:**

**Industrial setting.**

PROC2 Use in closed, continuous process with occasional controlled exposure. Continuous process but where the design philosophy is not specifically aimed at minimizing emissions. It is not high integrity and occasional expose will arise e.g. through maintenance, sampling and equipment breakages.

PROC3 Use in closed batch process (synthesis or formulation). Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, e.g. through enclosed transfers, but where some opportunity for contact with chemicals occurs, e.g. through sampling.

PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Manufacture or formulation of chemical products or arti-cles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.

PROC14 Production of preparations or articles by tabletting, compression, extrusion, pelletisation. Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predomi-nantly related to volatiles and/or generated fumes, dust may be formed as well.

**Name of contributing environmental scenario and corresponding ERCs:**

**ERC2** Formulation of preparations. Mixing and blending of substances into (chemical) preparations in all types of formulating industries, such as paints and do-it-yourself products, pigment paste, fuels, household products (cleaning products), lubricants, etc.

2. **Operational conditions and risk management measures**

2.1 **Control of workers exposure**

**Product characteristics:**
- Concentration of substance: 100%.
- Physical state: solid.

**Amounts used:** This information is not relevant for assessment of worker's exposure.

**Frequency and duration of use/exposure:**
- Duration: >4 hours/day.
- Frequency: <=3 days/year.

**Human factors not influenced by risk management:**
- PROC 2, 3: Not relevant.
- PROC 5, 14: Exposed skin surface: Gloves.

**Other given operational conditions affecting workers exposure:**
- Location: Indoor use.
- Domain: Industrial use.

**Technical conditions and measures at process level (source) to prevent release:** Not relevant

**Technical conditions and measures to control dispersion from source towards the worker:**
- Local exhaust ventilation: Yes (90% effectiveness).

**Organisational measures to prevent/limit releases, dispersion and exposure:** Not relevant
### Conditions and measures related to personal protection, hygiene and health evaluation:
- Respiratory protection: Not required.
- Gloves are implemented as an additional risk management measure. Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training.
- Suitable gloves are: Nitrile rubber, Neoprene, Polyvinyl alcohol (PVA), Viton.

### Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:
- Use Local Exhaust ventilation.
- Chemical resistant protective gloves must be worn.
- Smoking, eating and drinking are prohibited at the workplace.
- Generally accepted standards of occupational hygiene are maintained.
- Minimisation of manual phases/work tasks.
- Minimisation of splashes and spills.
- Avoidance of contact with contaminated tools and objects.
- Regular cleaning of equipment and work area.
- Training staff on good practice.
- Management/supervision in place to check that RMMs in place are being used correctly and OCs followed.

### 2.2 Control of environmental exposure

#### Product characteristics:
- Concentration of substance: Up to 100%.
- Physical state: solid.

#### Amounts used:
- Maximum daily use at a site: 30 ton.
- Maximum annual use at a site: 100 tons/year.
- Fraction of the main local source: 0.1.

#### Frequency and duration of use:
- Emission days: 3 days/year.
- Intermittent release.

#### Environmental factors not influenced by risk management:
- Flow rate of receiving surface water: >=18,000 m3/day (default).

#### Other given operational conditions affecting environmental exposure:
- Industry category: 11: Polymers industry.
- Use category: 53: Vulcanizing agents.
- Main category industrial use: III Multi-purpose equipment.
- Extra details on use category: Polymer processing, Thermoset resins: curing agents, cross-linking agents.
- Emission tables: A2.1 (general table), B2.8 (general table).
- Indoor use.
- Release fraction to air from process: 2.5E-03 (default).
- Release fraction to wastewater from process: 0.02 (default).
- Release fraction to soil from process: 1E-04 (default).

#### Technical conditions and measures at process level (source) to prevent release:
- Fraction connected to sewer system: 80% (default).

#### Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:
- Dry sludge application to agricultural soil: Yes (default).

#### Organisational measures to prevent/limit releases from site:
- Fraction of EU tonnage used in region (private use): 10% (default).

#### Conditions and measures related to municipal sewage treatment plant:
- Municipal Sewage Treatment Plant (STP): Yes (freshwater), No (marine assessment).
- Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town).
- Sewage Sludge Incineration: No (default).
- Concentration of chemical in untreated waste water: 0 mg/L (EUSES output).
- Concentration of chemical (total) in the STP effluent: 0 mg/L (EUSES output).

#### Conditions and measures related to external treatment of waste for disposal:
- Not relevant

#### Conditions and measures related to external recovery of waste:
- Not relevant

#### Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:
- Spills are cleaned immediately.

### 3. Exposure estimation

#### Health

#### Information for contributing scenario (1):
- PROC2, PROC3, PROC5, PROC14

#### Assessment method:
- ECETOC TRA Worker v2.0 with modifications. The RCR for dermal exposure was adjusted (0.1) to account for glove use.
### Exposure estimation:

<table>
<thead>
<tr>
<th>Route</th>
<th>Exposure estimate</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker, long-term, local</td>
<td>Dermal</td>
<td>0.0343 mg/kg bw/day</td>
<td>0.17</td>
</tr>
<tr>
<td>Worker, long-term, local</td>
<td>Inhalation</td>
<td>0.500 mg/m3</td>
<td>0.28</td>
</tr>
</tbody>
</table>

### Environment

Information for contributing scenario (2):

- **ERC**: ERC2

Assessment method:

- EUSES v2.1 based on 10 EU sites.

### Exposure estimation:

<table>
<thead>
<tr>
<th>Compartment</th>
<th>PEC</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>0.0000698 mg/L</td>
<td>0.004</td>
<td>Intermittent release based on 3 days/year</td>
</tr>
<tr>
<td>Freshwater sediment</td>
<td>0.000169 mg/kg ww</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Marine water</td>
<td>0.0000677 mg/L</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Marine water sediment</td>
<td>0.0000164 mg/kg ww</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>0.000149 mg/kg ww</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>STP</td>
<td>0 mg/L</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>0.000019 mg/m3</td>
<td>Not Available</td>
<td></td>
</tr>
</tbody>
</table>

**RCR**=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); **PEC**=Predicted environmental concentration.

### Exposure scenario (3): Laboratory sampling - pilot plant

1. **Exposure scenario (3)**

- **Short title of the exposure scenario**: Laboratory sampling - pilot plant

- **List of use descriptors**:
  - **Sector of use category (SU)**: SU10
  - **Product category (PC)**: PC32
  - **Process category (PROC)**: PROC9
  - **Environmental Release Category (ERC)**: ERC2

- **List of names of contributing worker scenarios and corresponding PROCs**: Industrial setting.
  - PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.

- **Name of contributing environmental scenario and corresponding ERCs**:
  - ERC2 Formulation of preparations. Mixing and blending of substances into (chemical) preparations in all types of formulating industries, such as paints and do-it-yourself products, pigment paste, fuels, household products (cleaning products), lubricants, etc.

2. **Operational conditions and risk management measures**

#### 2.1 Control of workers exposure

- **Product characteristics**: Concentration of substance: 100%. Physical state: solid.

- **Amounts used**: This information is not relevant for assessment of worker's exposure.

- **Frequency and duration of use/exposure**: Duration: >4 hours/day. Frequency: <=10 days/year.

- **Human factors not influenced by risk management**: Not relevant

- **Other given operational conditions affecting workers exposure**: Location: Indoor use. Domain: Industrial use.

- **Technical conditions and measures at process level (source) to prevent release**: Not relevant

- **Technical conditions and measures to control dispersion from source towards the worker**: Local exhaust ventilation: Yes (90% effectiveness).

- **Organisational measures to prevent/limit releases, dispersion and exposure**: Not relevant
**Conditions and measures related to personal protection, hygiene and health evaluation:**
- Respiratory protection: Not required.
- Gloves are implemented as an additional risk management measure.
- Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training.
- Suitable gloves are: Nitrile rubber, Neoprene, Polyvinyl alcohol (PVA), Viton.

**Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:**
- Use Local Exhaust ventilation.
- Chemical resistant protective gloves must be worn.
- Smoking, eating and drinking are prohibited at the workplace.
- Generally accepted standards of occupational hygiene are maintained.
- Minimisation of manual phases/work tasks.
- Minimisation of splashes and spills.
- Avoidance of contact with contaminated tools and objects.
- Regular cleaning of equipment and work area.
- Training staff on good practice.
- Management/supervision in place to check that RMMs in place are being used correctly and OCs followed.

### 2.2 Control of environmental exposure

**Product characteristics:**
- Concentration of substance: 100%.
- Physical state: solid.

**Amounts used:**
- Maximum daily use at a site: 25 kg/day.
- Maximum annual use at a site: 250 kg/year.
- Fraction of the main local source: 0.1.

**Frequency and duration of use:**
- Emission days: 10 days/year.
- Intermittent release.

**Environmental factors not influenced by risk management:**
- Flow rate of receiving surface water: >=18,000 m3/day (default).

**Other given operational conditions affecting environmental exposure:**
- Industry category: 11: Polymers industry.
- Use category: 53: Vulcanizing agents.
- Main category industrial use: III Multi-purpose equipment.
- Extra details on use category: Polymer processing, Thermoset resins: curing agents, cross-linking agents.
- Emission tables: A2.1 (general table), B2.8 (general table).
- Indoor use.
- Release fraction to air from process: 2.5E-03 (default).
- Release fraction to wastewater from process: 0.02 (default).
- Release fraction to soil from process: 1E-04 (default).

**Technical conditions and measures at process level (source) to prevent release:**
- Fraction connected to sewer system: 80% (default).

**Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:**
- Dry sludge application to agricultural soil: Yes (default).

**Organisational measures to prevent/limit releases from site:**
- Fraction of EU tonnage used in region (private use): 10% (default).

**Conditions and measures related to municipal sewage treatment plant:**
- Municipal Sewage Treatment Plant (STP): Yes (freshwater), No (marine assessment).
- Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town).
- Sewage Sludge Incineration: No (default).
- Concentration of chemical in untreated waste water: 0 mg/L (EUSES output).
- Concentration of chemical (total) in the STP effluent: 0 kg/d (EUSES output).

**Conditions and measures related to external treatment of waste for disposal:**
- Not relevant

**Conditions and measures related to external recovery of waste:**
- Not relevant

**Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:**
- Spills are cleaned immediately.

### 3. Exposure estimation

**Health**

**Assessment method:**
- ECETOC TRA Worker v2.0 with modifications. The RCR for dermal exposure was adjusted (0.1) to account for glove use.
**Exposure estimation:**

<table>
<thead>
<tr>
<th>Route</th>
<th>Exposure estimate</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker, long-term, local</td>
<td>Dermal</td>
<td>0.0686 mg/kg bw/day</td>
<td>0.34</td>
</tr>
<tr>
<td>Worker, long-term, local</td>
<td>Inhalation</td>
<td>0.500 mg/m³</td>
<td>0.28</td>
</tr>
</tbody>
</table>

**Environment**

**Information for contributing scenario (2):** ERC2

**Assessment method:** EUSES v2.1 based on 10 EU sites.

**Exposure estimation:**

<table>
<thead>
<tr>
<th>Compartment</th>
<th>PEC</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>0.0000000174 mg/L</td>
<td>0.00001</td>
<td>Intermittent release based on 10 days/year</td>
</tr>
<tr>
<td>Freshwater sediment</td>
<td>0.000000423 mg/kg ww</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>Marine water</td>
<td>0.000000169 mg/L</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>Marine water sediment</td>
<td>0.000000414 mg/kg ww</td>
<td>0.0001</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>0.000000373 mg/kg ww</td>
<td>0.00006</td>
<td></td>
</tr>
<tr>
<td>STP</td>
<td>0 mg/L</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>0.000000019 mg/m³</td>
<td>Not Available</td>
<td></td>
</tr>
</tbody>
</table>

**Health:**

Indoor use, medium dustiness, LEV used, no respirator required. Duration of activity >4 hours. Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training. Concentration of substance: Up to 100%.

**Environment:** Intermittent release based on 10 days/year. Maximum daily use at a site: 25 kg/day.

**Exposure scenario (4): Manufacture of rubber articles**

1. Exposure scenario (4)

**Short title of the exposure scenario:** Manufacture of Rubber Articles

**List of use descriptors:**

- **Sector of use category (SU):** SU11
- **Product category (PC):** PC32
- **Process category (PROC):** PROC3, PROC4, PROC5, PROC6, PROC8b, PROC9, PROC10, PROC13, PROC14, PROC21, PROC24

**Environmental Release Category (ERC):** ERC6d


**List of names of contributing worker scenarios and corresponding PROCs:**

- **Industrial setting.**
  - PROC3 Use in closed batch process (synthesis or formulation). Batch manufacture of a chemical or formulation where the predominant handling is in a contained manner, e.g. through enclosed transfers, but where some opportunity for contact with chemicals occurs, e.g. through sampling.
  - PROC4 Use in batch and other process (synthesis) where opportunity for exposure arises. Use in batch manufacture of a chemical where significant opportunity for exposure arises, e.g. during charging, sampling or discharge of material, and when the nature of the design is likely to result in exposure.
  - PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Manufacture or formulation of chemical products or art-icles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.
  - PROC6 Calendering operations. Processing of product matrix. Calendering at elevated temperature an large exposed surface.
  - PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
  - PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
  - PROC10 Roller application or brushing. Low energy spreading of e.g. coatings. Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
  - PROC13 Treatment of articles by dipping and pouring. Immersion operations. Treatment of articles by dipping, pouring, immersing, soaking, washing or washing in substances; including cold formation or resin type matrix. Includes handling of treated objects (e.g. after drying, plating.). Substance is applied to a surface by low energy tech-niques such as dipping the article into a bath or pouring a preparation onto a surface.
  - PROC14 Production of preparations or articles by tabletting, compression, extrusion, pelletisation. Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predomi-nantly related to volatiles and/or generated fumes, dust may be formed as well.
  - PROC21 Low energy manipulation of substances bound in materials and/or articles. Manual cutting, cold rolling or assembly/disassembly of material/article (including metals in massive form), possi-bly resulting in the release of fibres, metal fumes or dust.
  - PROC24 High (mechanical) energy work-up of substances bound in materials and/or articles. Substantial thermal or kinetic energy applied to sub-stance (including metals in massive form) by hot rolling/forming, grinding, mechanical cutting, drilling or sanding. Exposure is predominantly expected to be to dust. Dust or aerosol emission as result of direct cooling may be expected.

**Name of contributing environmental scenario and corresponding ERCs:**

ERC6d Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers. Industrial use of chemicals (cross-linking agents, curing agents) in the production of thermostets and rubbers, polymer processing.

**Further explanations:**
N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide is used as a vulcanizing agent in the manufacture of rubber articles. This scenario covers both the manufacture of rubber articles using N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide as such (100%) or as part of a formulated product (25%). The manufacturing processes are the same regardless if the neat or formulated product is used; therefore, the same exposure scenario can be used for both. Releases of N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide are expected during the formulation of preparations and manufacturing of rubber articles and tyres mainly via wastewater.

2. Operational conditions and risk management measures

2.1 Control of workers exposure

| Product characteristics: | Concentration of substance: Up to 100%. |
| Physical state: solid. |
| Amounts used: | This information is not relevant for assessment of worker's exposure. |
| Frequency and duration of use/exposure: | Duration: >4 hours/day. |
| Frequency: <=220 days/year. |
| Human factors not influenced by risk management: | Not relevant |
| Other given operational conditions affecting workers exposure: | Location: Indoor use. |
| Domain: Industrial use. |
| Technical conditions and measures at process level (source) to prevent release: | Not relevant |
| Technical conditions and measures to control dispersion from source towards the worker: | PROC3, PROC4, PROC5, PROC6, PROC9, PROC10, PROC13, PROC14, PROC21, PROC24: Local exhaust ventilation: Yes (90% effectiveness). |
| PROC8b: Local exhaust ventilation: Yes (95% effectiveness). |
| Organisational measures to prevent/limit releases, dispersion and exposure: | Not relevant |
| Conditions and measures related to personal protection, hygiene and health evaluation: | Respiratory protection: Not required. |
| Gloves are implemented as an additional risk management measure. |
| Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training. |
| Suitable gloves are: Nitrile rubber, Neoprene, Polyvinyl alcohol (PVA), Viton. |
| Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply: | Use Local Exhaust ventilation. |
| Chemical resistant protective gloves must be worn. |
| Smoking, eating and drinking are prohibited at the workplace. |
| Generally accepted standards of occupational hygiene are maintained. |
| Minimisation of manual phases/work tasks. |
| Minimisation of splashes and spills. |
| Avoidance of contact with contaminated tools and objects. |
| Regular cleaning of equipment and work area. |
| Training staff on good practice. |
| Management/supervision in place to check that RMMs in place are being used correctly and OCs followed. |

2.2 Control of environmental exposure

| Product characteristics: | Concentration of substance: Up to 100%. |
| Physical state: solid. |
| Amounts used: | Maximum daily use at a site: 0.45 ton/day. |
| Maximum annual use at a site: 100 tons/year. |
| Fraction of the main local source: 0.1. |
| Frequency and duration of use: | Emission days: 220 days/year. |
| Continuous use/release. |
| Environmental factors not influenced by risk management: | Flow rate of receiving surface water: >=18,000 m3/day (default). |
| Other given operational conditions affecting environmental exposure: | Industry category: 11: Polymers industry. |
| Use category: 53: Vulcanizing agents. |
| Main category industrial use: III Non-dispersive. |
| Extra details on use category: Polymer processing, Thermoset resins: curing agents, cross-linking agents. |
| Emission tables: A3.11 (specific uses), B3.9 (general table). |
| Indoor use. |
| Release fraction to air from process: 2.5E-03 (ETRMA Factor Guidance). |
| Release fraction to wastewaterv from process: 5E-05 (default). |
| Release fraction to soil from process: 1E-05 (default). |
SDS Name: CURE-RITE* 18 Powder

Technical conditions and measures at process level (source) to prevent release:
Fraction connected to sewer system: 80% (default).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:
Dry sludge application to agricultural soil: Yes (default).

Organisational measures to prevent/limit releases from site:
Fraction of EU tonnage used in region (private use): 10% (default).

Conditions and measures related to municipal sewage treatment plant:
Municipal Sewage Treatment Plant (STP): Yes (freshwater), No (marine assessment).
Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town).
Sewage Sludge Incineration: No (default).
Concentration of chemical in untreated waste water: 0 mg/L (EUSES output).
Concentration of chemical (total) in the STP effluent: 0 mg/L (EUSES output).

Conditions and measures related to external treatment of waste for disposal:
Not relevant

Conditions and measures related to external recovery of waste:
Not relevant

Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:
Spills are cleaned immediately.

3. Exposure estimation

Health

Information for contributing scenario (1):
PROC3, PROC4, PROC5, PROC6, PROC8b, PROC9, PROC10, PROC13, PROC14, PROC21, PROC24

Assessment method:
ECETOC TRA Worker v2.0 with modifications. The RCR for dermal exposure was adjusted (0.1) to account for glove use.

Exposure estimation:

<table>
<thead>
<tr>
<th>Route</th>
<th>Exposure estimate</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worker, long-term, local</td>
<td>Dermal</td>
<td>0.137 mg/kg bw/day</td>
<td>0.67</td>
</tr>
<tr>
<td>Worker, long-term, local</td>
<td>Inhalation</td>
<td>0.500 mg/m3</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Environment

Information for contributing scenario (2): ERC6d

Assessment method:
EUSES v2.1 based on 10 EU sites.

Exposure estimation:

<table>
<thead>
<tr>
<th>Compartment</th>
<th>PEC</th>
<th>RCR</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>0.0000085 mg/L</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Freshwater sediment</td>
<td>0.000021 mg/kg ww</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Marine water</td>
<td>0.000000818 mg/L</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Marine water sediment</td>
<td>0.00000203 mg/kg ww</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>0.000174 mg/kg ww</td>
<td>0.075</td>
<td></td>
</tr>
<tr>
<td>STP</td>
<td>0 mg/L</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>0.000019 mg/m3</td>
<td>Not Available</td>
<td></td>
</tr>
</tbody>
</table>

RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.

4. Guidance to the Downstream User to evaluate whether he works inside the boundaries of the ES

Health:
Indoor use, medium dustiness, LEV used, no respirator required. Duration of activity >4 hours. Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training. Concentration of substance: Up to 100%.

Environment:
Continuous use/release. Maximum daily use at a site: 0.45 ton/day.

Exposure scenario (5): Manufacture of Tyres

1. Exposure scenario (5)

Short title of the exposure scenario: Manufacture of Tyres

List of use descriptors:
Sector of use category (SU): SU11
Product category (PC): PC32
Process category (PROC): PROC5, PROC8b, PROC9, PROC10, PROC14, PROC21
Environmental Release Category (ERC): ERC6d

**SDS Name: CURE-RITE* 18 Powder**

### List of names of contributing worker scenarios and corresponding PROCs:

**Industrial setting.**
- PROC5 Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Manufacture or formulation of chemical products or articles using technologies related to mixing and blending of solid or liquid materials, and where the process is in stages and provides the opportunity for significant contact at any stage.
- PROC8b Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities. Sampling, loading, filling, transfer, dumping, bagging in dedicated facilities. Exposure related to dust, vapour, aerosols or spillage, and cleaning of equipment to be expected.
- PROC9 Transfer of substance or preparation into small containers (dedicated filling line, including weighing). Filling lines specifically designed to both capture vapour and aerosol emissions and minimise spillage.
- PROC10 Roller application or brushing. Low energy spreading of e.g. coatings. Including cleaning of surfaces. Substance can be inhaled as vapours, skin contact can occur through droplets, splashes, working with wipes and handling of treated surfaces.
- PROC14 Production of preparations or articles by tabletting, compression, extrusion, pelletisation. Processing of preparations and/or substances (liquid and solid) into preparations or articles. Substances in the chemical matrix may be exposed to elevated mechanical and/or thermal energy conditions. Exposure is predominantly related to volatiles and/or generated fumes, dust may be formed as well.
- PROC21 Low energy manipulation of substances bound in materials and/or articles. Manual cutting, cold rolling or assembly/disassembly of material/article (including metals in massive form), possibly resulting in the release of fibres, metal fumes or dust.

### Name of contributing environmental scenario and corresponding ERCs:

- ERC6d Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers. Industrial use of chemicals (cross-linking agents, curing agents) in the production of thermosets and rubbers, polymer processing.

### Further explanations:

N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide is used as a vulcanizing agent in the manufacture of tyres. This scenario covers both the manufacture of tyres using N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide as such (100%) or as part of a formulated product (25%). The manufacturing processes are the same regardless if the neat or formulated product is used; therefore, the same exposure scenario can be used for both. Releases of N-oxydiethylenethiocarbamyl-N-oxydiethylenesulfenamide are expected during the formulation of preparations and manufacturing of rubber articles and tyres mainly via wastewater.

### 2. Operational conditions and risk management measures

#### 2.1 Control of workers exposure

**Product characteristics:**
- Concentration of substance: Up to 100%.
- Physical state: solid.

**Amounts used:**
This information is not relevant for assessment of worker’s exposure.

**Frequency and duration of use/exposure:**
- Duration: >4 hours/day.
- Frequency: <=220 days/year.

**Human factors not influenced by risk management:**
Not relevant

**Other given operational conditions affecting workers exposure:**
- Location: Indoor use.
- Domain: Industrial use.

**Technical conditions and measures at process level (source) to prevent release:**
Not relevant

**Technical conditions and measures to control dispersion from source towards the worker:**
- PROC5, PROC9, PROC10, PROC14, PROC21: Local exhaust ventilation: Yes (90% effectiveness).
- PROC8b: Local exhaust ventilation: Yes (95% effectiveness).

**Organisational measures to prevent/limit releases, dispersion and exposure:**
Not relevant

**Conditions and measures related to personal protection, hygiene and health evaluation:**
- Respiratory protection: Not required.
- Gloves are implemented as an additional risk management measure.
- Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training.
- Suitable gloves are: Nitrile rubber, Neoprene, Polyvinyl alcohol (PVA), Viton.

**Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply:**
- Use Local Exhaust ventilation.
- Chemical resistant protective gloves must be worn.
- Smoking, eating and drinking are prohibited at the workplace.
- Generally accepted standards of occupational hygiene are maintained.
- Minimisation of manual phases/work tasks.
- Minimisation of splashes and spills.
- Avoidance of contact with contaminated tools and objects.
- Regular cleaning of equipment and work area.
- Training staff on good practice.
- Management/supervision in place to check that RMMs in place are being used correctly and OCs followed.

#### 2.2 Control of environmental exposure

**Product characteristics:**
- Concentration of substance: Up to 100%.
- Physical state: solid.
Amounts used:  
Maximum daily use at a site: 0.45 ton/day.  
Maximum annual use at a site: 100 tons/year.  
Fraction of the main local source: 0.1.

Frequency and duration of use:  
Emission days: 220 days/year.  
Continuous use/release.

Environmental factors not influenced by risk management:  
Flow rate of receiving surface water: >=18,000 m3/day (default).

Other given operational conditions affecting environmental exposure:  
Industry category: 11: Polymers industry.  
Use category: 53: Vulcanizing agents.  
Main category industrial use: III Non-dispersive.  
Extra details on use category: Polymer processing, Thermoset resins: curing agents, cross-linking agents.  
Emission tables: A3.11 (specific uses), B3.9 (general table).  
Indoor use.  
Release fraction to air from process: 2.5E-03 (default).  
Release fraction to wastewater from process: 5E-05 (default).  
Release fraction to soil from process: 1E-05 (default).

Technical conditions and measures at process level (source) to prevent release:  
Fraction connected to sewer system: 80% (default).

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil:  
Dry sludge application to agricultural soil: Yes (default).

Organisational measures to prevent/limit releases from site:  
Fraction of EU tonnage used in region (private use): 10% (default).

Conditions and measures related to municipal sewage treatment plant:  
Municipal Sewage Treatment Plant (STP): Yes (freshwater), No (marine assessment).  
Size of municipal sewage system/treatment plant: >=2000 m3/day (standard town).  
Sewage Sludge Incineration: No (default).  
Concentration of chemical in untreated waste water: 0 mg/L (EUSES output).  
Concentration of chemical (total) in the STP effluent: 0 mg/L (EUSES output).

3. Exposure estimation

Health

Information for contributing scenario (1): PROC5, PROC8b, PROC9, PROC10, PROC14, PROC21

Assessment method: ECETOC TRA Worker v2.0 with modifications. The RCR for dermal exposure was adjusted (0.1) to account for glove use.

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Environment

Information for contributing scenario (2): ERC6d

Assessment method: EUSES v2.1 based on 10 EU sites.

Exposure estimation:

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RCR=Risk characterization ratio (PEC/PNEC or Exposure estimate/DNEL); PEC=Predicted environmental concentration.
4. Guidance to the Downstream User to evaluate whether he works inside the boundaries of the ES

**Health:** Indoor use, medium dustiness, LEV used, no respirator required. Duration of activity >4 hours. Wear chemical resistant gloves (tested to EN 374) in combination with basic employee training. Concentration of substance: Up to 100%.

**Environment:** Continuous use/release. Maximum daily use at a site: 0.45 ton/day.